

ENVIRO ACOUSTIC RESEARCH

Based in Pretoria, Enviro Acoustic Research (EARES) started in 2007 with the objective to become the foremost Environmental Noise Consultant in Africa. We aim to assist our clients to accurately define existing ambient sound levels as well as the magnitude and the significance of their environmental noise impact. This is done by collecting ambient sound level measurements over a few nights (minimum 2, as per GNR 320 of 2020) as well as visually illustrating the potential noise contours. Potential noise impacts are clearly defined, with reports proposing of appropriate and cost-effective solutions to manage and control the potential noise impact.

Since starting in 2007, EARES has assisted more than 60 clients (Consulting Engineers, Environmental Consultants, Industry, Mining, Town Planners and private clients) with more than 400 Environmental Noise projects in SAC. While we only specialize in Environmental Noise and Vibration, we closely work with specialist companies in Structural and Architectural Acoustics.

WHY ENVIRO-ACOUSTIC RESEARCH?

- Been in business for more than a decade.
- Numerous happy return clients.
- Under-promise, over deliver policy.
- Always meeting deadlines – in time, within budget.
- Quality of work exceeding the expectations of clients.
- With more than 10 calibrated sound level analyzers/meters, we can run a number of projects in parallel. All instruments are fitted with specialist imported wind shields.
- All instruments setup for unattended sound level measurements in all weather conditions.

WHAT DO WE DO

- **Providing Legal and Technical Review of noise studies in terms of SANS 10328:2008.**
- **Ambient sound and noise level monitoring, at up to 10 locations simultaneously, up to a duration of 4-weeks.**
- **Statistical analysis of sound and noise level data.**
- **Noise audits and measurement reports.**
- **Noise prediction, design of mitigation, management and control**
- **Environmental Noise Impact Assessments for urban development, road and railway projects, industrial and mining activities as well as renewable energy.**

HOW DO WE DO THAT?

Defining Ambient Sound and Noise Levels

Enviro-Acoustic Research cc (EARES) would take the optimal number of sound measurements to ensure that the Ambient Sound level (or residual noise level, depending on the area and the definitions) can be sufficiently defined. In terms of the latest Procedures for the Assessment (Government Gazette 43110, Regulation 320), ambient sound levels should be measured during at least 2 different time periods for two nights. For the last 10 years EARES have done better, with default measurements collected over at least 24 hours, and, since the promulgation of GNR 320, a minimum of a 2-night period. Where required, these measurement data is augmented by a number of short 10-minute measurements.

With more than ten (10) all-weather long-term sound level measurement stations (with anemometers, temperature and humidity sensors), sound and noise levels can be measured for unlimited periods (we have

done measurements for up to 4 weeks at certain locations).



These instruments are referenced in the field using Class 1 Calibrators, with all sound measurement equipment calibrated as required by SANS 10103:2008 by a SANAS laboratory. At least eight instruments are equipped with

third-octave frequency analyzers with some instruments having recording capability. We use specially imported wind shields to allow long-term continuous measurements in field, even in torrential rains (although this data will be excluded).

Variables and measurement settings are selected to define the surrounding acoustical environment included sound descriptors such as L_{Aeq} (National & International), L_{AMin} , L_{AMax} , L_{A90} , L_{A10} as well as third octave spectral analysis (see also **Figure 1**). Depending on the scope of study, certain measurement data may be analyzed in terms of best fit (**Figure 1**).

EARES also take significant time is summarizing the measured sound levels as illustrated in **Figure 2**. This allows a summary of sound or noise levels at a glance, the location where this noise level was measured, and a visual presentation of the sound levels that can be used in presentations to the client / public.

This allows us to identify other potential sources of noise, also allowing us to investigate future cumulative impacts due to a proposed development. Using this data allows us to model an accurate 3D sound environment for the area under investigation. While it may not be apparent, significant work goes into each study to ensure that the ambient sound levels are accurately defined for the whole area under investigation.

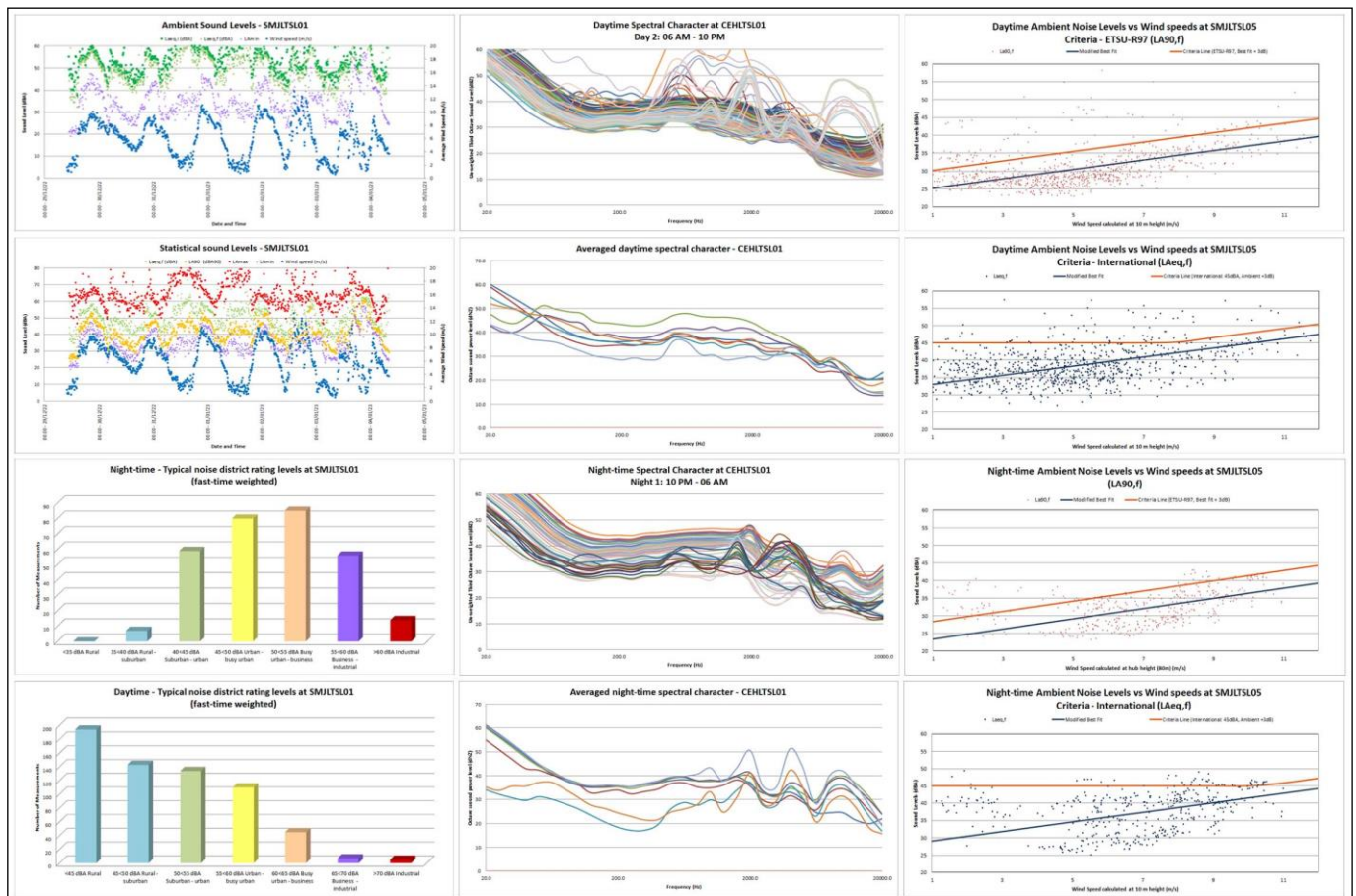


Figure 1: Defining the existing baseline – Acoustical measurements and data presentation

Setting Appropriate Noise Limits, using correct Legislation and Standards

EARES realize that each project is unique, with different challenges and opportunities, operating in diverse communities with a distinct soundscape. Using the information derived from field measurements allows the motivation of the most appropriate noise limits,

considering both international best practice and noise limits, as well as national / provincial regulations to best protect the surrounding environment without setting conditions that may limit the development of the project under investigation.

Impact Modeling and Identification of Receptors

Considering the project description as provided by the client, we conceptualise potential noise sources, discussing the conceptual scenario with the client allowing the modelling of the various noise-generating activities that could be expected due to the construction, operational and even closure phases. This data is represented as isopleths of constant noise levels in various formats as seen in **Figure 3**. Apart from the

impact that the activity(ies) may have on the surrounding environment, we also investigate issues such as the future (predicted) total noise levels, allowing the quantification of unacceptably high noises (as stipulated by local ordinances) and changes that receptors may experience (considering guidelines published by SANS 10103:2008, WHO or IFC Noise

Limits), directly relating to the proposed activity/development.

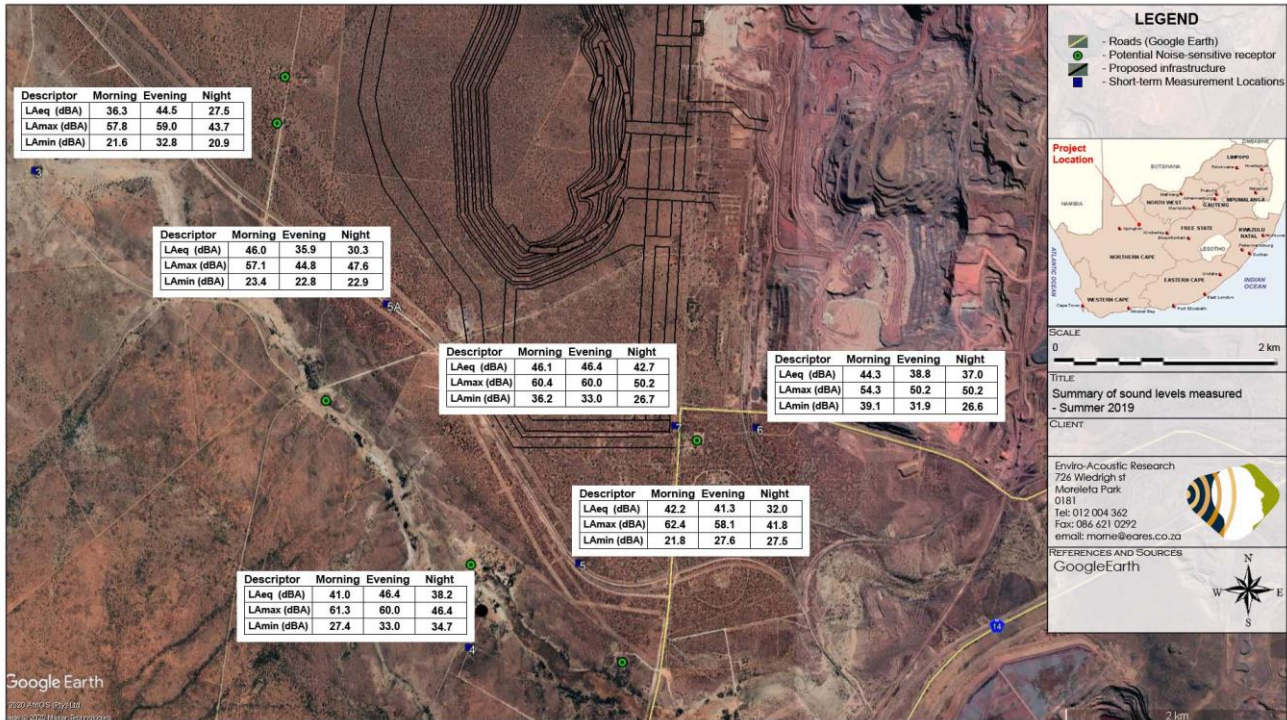


Figure 2: Defining the existing baseline – Summary of various sound level descriptors

Conceptual Barrier Design and cost optimization

Small or large, we can model the noise rating levels on the surrounding environment, allowing us to focus specifically on one or many noise-sensitive receptors. This allows for the simulated addition of mitigation

measures (such as barriers and enclosures) to ensure that the project would be able to comply with international guidelines, national regulations and stipulated standards when it comes to noise impacts.

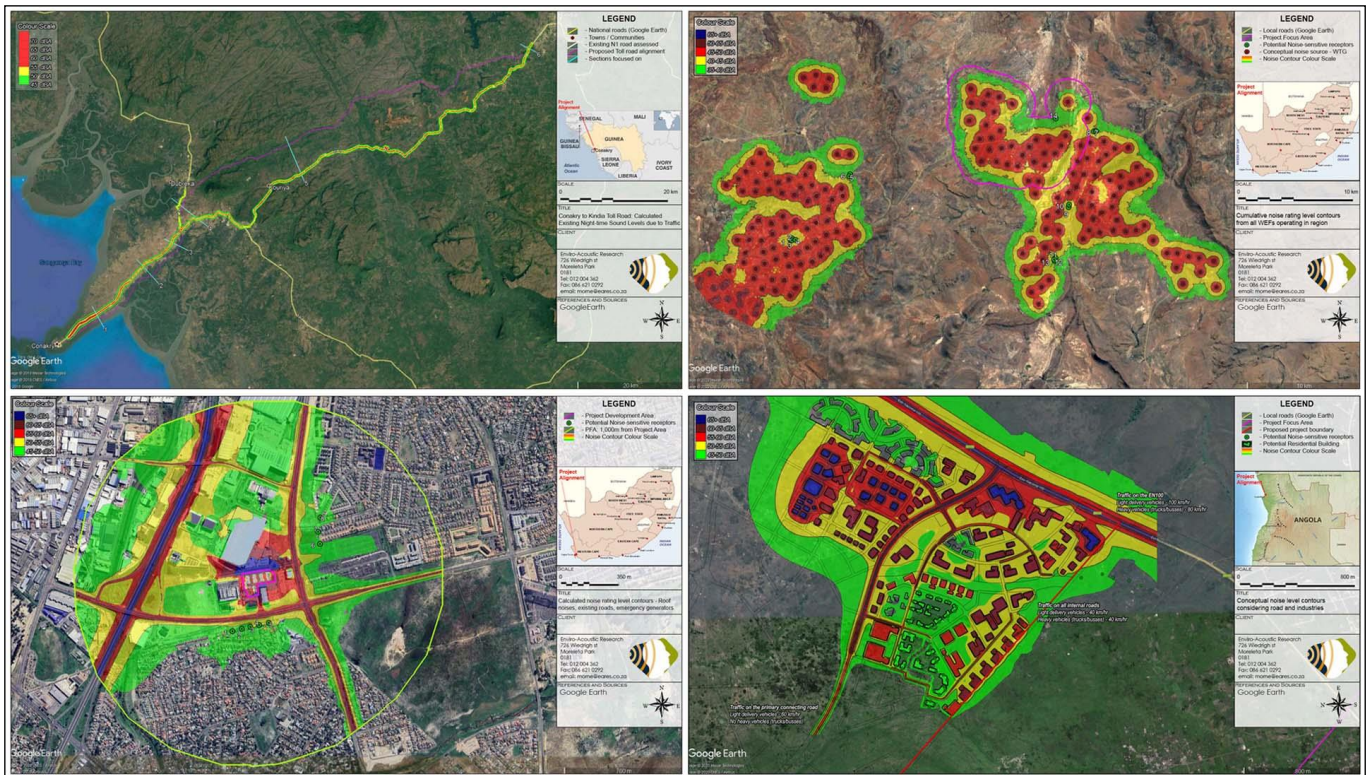


Figure 3: Various illustrations indicating the manner in which modelling data is presented

Impact Determination

Using the methods as recommended by the regulatory authorities (or a similar method as required by the client), we determine the significance of impacts due to noise from the various activities for each phase (construction, operational and closure phases; where required), whether the activity(ies) takes place at night or day. Due to the methodology employed, the impact assessment automatically considers cumulative impacts

due to other project activities, as well as the pre-project ambient sound levels. This allows the accurate determination of components such as magnitude (intensity) and spatial extent, that, together with field work (assisting with the determination of probabilities) and project information (duration of activity), defining the impact significance. See also **Table 1**.

Nature:			Nature of impact:		
Night-time ambient sound levels could range between 21 dBA to more than 64 dBA, averaging at 41.7 dBA. Ambient sound levels are expected to be low during period of low winds, and it is expected that introduced noises will be audible over large distances during quiet periods (during low wind conditions).			Wind turbine generators ("WTG") will only operate during period with increased winds, when ambient sound levels are higher than periods with no or low winds. As discussed and motivated in section 6.4 (see Table 6-2 and illustrated in Figures 4-28 and 4-29), ambient sound levels will likely be higher with this assessment assuming an ambient sound level of 43.5 dBA (for a 10 m/s wind speed).		
Various construction activities (though unlikely, but activities may be limited to the pouring of concrete as well as erection of WTG components) taking place simultaneously at night will increase ambient sound levels due to air-borne noise, using the criteria of the author.			Numerous WTG of the wind energy project operating simultaneously at night will increase ambient sound levels due to air-borne noise from the WTG. The projected noise levels, the change in ambient sound levels as well as the potential noise impact is defined per noise-sensitive receptors ("NSR") in Appendix F, Table 6 (worst-case scenario for a WTG with a SPL of 112.0 dBA (re 1 pW)) and summarized in this table.		
The projected noise levels, the change in ambient sound levels as well as the potential noise impact is defined per NSR in Appendix F, Table 5 per noise-sensitive receptor and summarized in this table.			The potential noise level (and significance) when using a quieter WTG (such as a WTG with an SPL of 108.1 dBA re 1 pW) is presented in Appendix F, Table 7 .		
	Without mitigation	With mitigation		Without mitigation	With mitigation
Magnitude (see Table 6-3)	Low (4)	Low (4)	Magnitude (see Table 6-3)	Low (4)	Minor (2)
Extent (see Table 6-4)	Regional (3)	Regional (3)	Extent (see Table 6-4)	Regional (3)	Regional (3)
Duration (see Table 6-5)	Short-term (2)	Short-term (2)	Duration (see Table 6-5)	Long-term (4)	Long-term (4)
Probability (see Table 6-6)	Possible (2)	Possible (2)	Probability (see Table 6-6)	Likely (3)	Possible (2)
Significance (see Table 6-7)	Low (18)	Low (18)	Significance (see Table 6-7)	Medium (33)	Low (18)
Status (+ or -)	Negative	Negative	Status (+ or -)	Negative	Negative
Reversibility	High	High	Reversibility	High	High
Loss of resources?	No	No	Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes	Can impacts be mitigated?	Yes	Yes
Mitigation: The significance of the noise impact is low for night-time construction activities and additional mitigation is not required. However, night-time construction activities may generate noises that some NSR may find annoying and it is recommended that the applicant consider: <ul style="list-style-type: none"> Minimizing night-time activities when working within 2,000m from NSR where possible; The applicant must notify the NSR when night-time activities will be taking place within 1,000m from the NSR; and The applicant must plan the completion of noisiest activities (such as pile driving, rock breaking and excavation) during the daytime period (even though it is expected that it is highly unlikely that this may take place at night); ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised; include a component covering environmental noise in the Health and Safety. Induction to sensitize all employees and contractors about the potential impact from noise, especially those employees and contractors that have to travel past receptors at night, or might be required to do work close (within 1,500m) to NSR at night. This should include issues such as minimising the use of vehicle horns; 			Mitigation: The significance of the noise impact is medium and additional mitigation is recommended and required. Mitigation measures are available and it is recommended that: <ul style="list-style-type: none"> the applicant design and implement a noise abatement programme, which may include operating certain wind turbines in a reduced noise emission mode (it will be required that the applicant select a WTG that have the capability to operate in a reduced noise emission mode); or The applicant can select a WTG that have a maximum sound power emission level less than approximately 110.0 dBA (re 1 pW) at locations closer than 2,000 m from any verified NSR. This layout and specific details of the selected WTG must be modelled to ensure that noise levels are less than 45 dBA at all NSR; or The applicant can change to layout to move certain WTG (such as T10, T12 and T13) further from verified NSR (NSR03 and NSR04 - the layout should be modelled to ensure that the potential noise levels will be less than 45 at all NSR); or The applicant can reduce the number of WTG located within 2,000m from NSR03 and NSR04 (the layout should be modelled to ensure that the potential noise levels will be less than 45 at all NSR); or The applicant can relocate certain of the verified NSR, or reach agreement with the land owner that the structures at NSR03 and NSR04 will not be used for permanent use if the Kaladokhwe WEF 1 proceeds. 		
Residual Risks: There is no risk of any residual noises.			Residual Risks: There is no risk of any residual noises.		

Table 1: Determination of the significance of the impacts of various activities (done for each phase)

CONCLUDING REMARKS

We trust that this very brief overview of our capabilities can indicate that we can:

- Gather ambient sound and noise levels scientifically, using calibrated and correct instrumentation.
- Analysis of data to statistically and determine and motivate appropriate ambient sound levels for the project area.
- Complete the requested Noise Impact Assessment / Study within the required standards, within the time schedule and cost estimate at a standard exceeding the expectations of the client.

- Present the findings and conclusions to Interested and Affected Parties.
- Assist the client with significant awareness of the project, its noise impact, and the appropriate management measures to reduce potential impacts within set standards that will allow the project to reach full potential.
- Reports formatted to assist EAPs to extract required information easily, with information presented to allow interested and affected parties understand potential impact and how a proposed development will manage potential noise impacts to acceptable levels.

If you still have any additional questions, or have any uncertainties, please feel free to contact us for a meeting where we could present on how our company can assist you to add value to projects.

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